

## THE GENUS *OPHIORRHIZA* L. (RUBIACEAE) IN AUSTRALIA

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### Summary

One species of *Ophiorrhiza* L. occurs in Australia viz *O. australiana*. The subspecies *O. australiana* subsp. *heterostyla* is described as new. A description of the genus and of the Australian species is given, together with notes on its habitat, distribution and conservation status.

### Introduction

The genus *Ophiorrhiza* L. is distributed throughout the Indo-Malesian region and has its greatest diversity in south east Asia and New Guinea. *Ophiorrhiza* has approximately 150 species (Mabberley 1989) with one species, *O. australiana* Benth., being recorded for Australia. This species was described by Benth (1866) from material collected from Rockingham Bay in north eastern Queensland. While I was preparing an account of *Ophiorrhiza* for the Flora of Australia it became apparent that there are two distinct taxa within the genus in Australia. The paper gives a detailed description of *O. australiana* s. str. and describes a new subspecies.

### Materials and Methods

Herbarium material from BRI, K, QRS and MEL has been examined. Measurements have been taken from dried or spirit material.

Pollen was collected from herbarium specimens at BRI and prepared by the standard acetolysis method outlined by Erdtman (1969). Acetolysed grains were air dried from 100% acetone onto aluminium stubs. These samples were sputter coated with platinum and examined with a Phillips 500 scanning electron microscope.

### Taxonomy

*Ophiorrhiza* L., Sp. Pl. 150 (1753), Gen. Pl. ed. 5: 74 (1754). Type: *O. mungos* L. (lecto, fide Hitchcock & Green (1929)).

**Derivation of name:** From the Greek *ophios* (a snake), *rhiza* (root); in reference to the long spreading serpentine roots.

Erect or ascending herbs or shrubs. Leaves opposite, mostly petiolate, chartaceous, elliptic-lanceolate or lanceolate-ovate or obovate to ovate, entire, penninerved, without domatia. Stipules interpetiolar, entire or lobed, persistent or caducous. Flowers in terminal (rarely axillary) helicoid cymes, usually united into umbelliform-corymbiform inflorescences; bracts small, setaceous to well developed leaf-like structures, or absent. Flowers isostylous or heterostylous. Perianth epigynous. Calyx 5-merous, minute. Corolla tube cylindrical, infundibuliform or suburceolate; lobes 5, valvate. Androecium 5; filaments adnate to corolla tube; anthers included or exserted. Ovary 2-celled, subglobose to obovoid, often conspicuously ribbed, crowned with 2-lobed disk; placenta fleshy attached to septum by short stalk; ovules numerous. Style included or exserted, filiform; stigma bifid, filiform, capitate or clavate. Capsule 2-celled laterally flattened, obcoronate or mitriform (rarely subglobose), mostly broader than long, dehiscent loculicidally. Seeds numerous, minute, rhomboid to obconic.

*Ophiorrhiza australiana* Benth., Fl. austral. 3: 407 (1866). Type: Queensland. Rockingham Bay, undated, *Dallachy* s.n. (holo: K).

Ascending to erect herbs or subshrubs to 60 (150) cm high. Stems usually not or slightly branched, densely covered when young with weak crisped, ferruginous to whitish hairs up to 1.0 mm long. Leaves chartaceous, discolourous, green above, paler beneath, narrowly elliptic to elliptic or lanceolate to narrowly ovate, 8–16 cm long, 2.5–6 cm wide, midrib flat to canaliculate above, prominent below, secondary veins 9–14 per side,

flat above, prominent below, acute or attenuate at base, acute to acuminate at apex; petiole slender, canaliculate, 1.0–4.0 cm long, densely covered with weak, crisped hairs. Stipule-sheath caducous, coriaceous, produced into 1 or 2 setae, totally 4–12 mm long. Inflorescences terminal cymes, compact, corymbiform, 3–6-branched, 1–5 cm long, 10–20 flowers per branch; peduncles 1–6 cm long, sparsely to densely covered with weak, crisped, stramineous to ferruginous hairs; bracts setaceous, up to 4 mm long. Flowers 5 (rarely 4 or 6)-merous, sessile or on short pedicels up to 1 mm long, isostylous or heterostylous. Calyx lobes triangular to deltoid, 0.7–1.5 mm long, puberulent. Corolla cream or pink, hypocrateriform; tube 2.5–4.0 mm long, pubescent outside with short erect hairs, glabrous inside except densely bearded at throat; hairs up to 1.5 mm long, with wavy lateral walls; lobes ovate, pubescent outside with short erect hairs, densely papillose inside. In isostylous flowers stamens included, filaments filiform, 0.5–1.0 mm long, adnate to corolla at 1/5 to 1/4 the length of corolla tube, anthers linear, c. 1.0 mm long; style filiform, 1.0–1.7 mm long; stigma bifid; lobes c. 0.5 mm long. In heterostylous short-styled flowers stamens exserted, filaments filiform, 2.5–3.5 mm long, adnate to corolla at 1/4 to 1/2 the length of corolla tube; anthers linear, c. 1.5 mm long; style filiform, c. 1.5 mm long; stigma bifid; lobes filiform c. 1 mm long, erect. In heterostylous long-styled flowers stamens included, filaments filiform, c. 0.5 mm long, adnate to corolla c. 1/4 the length of corolla tube; anthers linear, c. 1.5 mm long; style filiform, 4.0–5.0 mm long; stigma capitate. Ovary 2-celled, subglobose to obovoid, 1–1.5 mm diameter, ridged, capped by a 2-lobed disk which encircles base of style. Placenta fleshy, peltately attached by short stalk to septum; ovules 8–20/locule. Capsules mitriform, 2–3 mm long, 6–7 mm wide, pubescent, splitting loculicidally. Seeds irregular shaped, cubic to obconic, c. 0.5 mm along the longest axis; testa brown, faintly reticulate. **Fig. 1.**

#### Key to subspecies of *Ophiorrhiza australiana*

1. Flowers isostylous; indumentum on upper leaf surface composed of weak, crisped, ferruginous hairs; corolla lobes 1–2 mm long  
     ..... ***O. australiana* subsp. *australiana***
- Flowers heterostylous; indumentum on upper leaf surface composed of more or less straight, erect to appressed, whitish hairs; corolla lobes 1.5–4 mm long  
     ..... ***O. australiana* subsp. *heterostyla***

#### *Ophiorrhiza australiana* Benth. subsp. *australiana*

Young stems, peduncles and petioles densely covered with weak crisped, ferruginous hairs. Leaf lamina on both surfaces covered with scattered weak, crisped, hairs; midrib and secondary veins often purplish especially towards leaf base. Flowers isostylous; corolla lobes 1–2 mm long. **Fig. 2.**

I have examined pollen of this subspecies (**Fig. 1**) which is similar in structure to pollen of the Pacific species of *Ophiorrhiza* described by Darwin (1976). The pollen grains are 3-colporate, isopolar, radially symmetrical, spheroidal to subprolate in equatorial view with equatorial axis length 33–48  $\mu$ , subtriangular in polar view with polar axis length 32–40  $\mu$ ; colpi 22–26  $\mu$  long; ora circular, 3–5  $\mu$  in diameter; margin crassimarginate; exine surface semitectate, reticulate-perforate; collumellae numerous; lumina 0.5–1  $\mu$  in diameter.

**Representative specimens:** Queensland. COOK DISTRICT: Gap Creek, c. 22 miles [35 km] S by E of Cooktown, 15°4'–S, 145°1'–E, May 1969, *Smith* s.n. [AQ 339973] (BRI); end of Granite Creek logging road Bloomfield River, W of Ayton, May 1969, *Webb & Tracey* 9000 (BRI); Daintree, 16°15'S, 145°19'E, Nov 1954, *Blake* 19728 (BRI); foothills Thornton Peak, Sep 1937, *Brass & White* 269 (BRI); Mosman Intake, 16°27'S, 145°22'E, Aug 1957, *Smith* 10030 (BRI); N of Kuranda, Sep 1963, *Hyland* AFO/2817 (BRI); F.R. 1073, 16°45'S, 145°30'E, Nov 1965, *Rudder* 4047 (BRI); Yarrabah, [16°54'S, 145°52'E], Oct 1918, *Michael* 568 (BRI); Freshwater Creek, S of Redlynch, 16°59'S, 145°40'E, Oct 1973, *Webb & Tracey* 13655 (BRI, QRS); N.P.R. 226 (Harvey Creek), 17°15'S, 145°50'E, Jan 1972, *Hyland* 5784 (BRI, QRS); Weinerts Creek, Babinda, 17°20'S, 145°54'E, Nov 1982, *Jago* 557 (QRS); Wyvuri Holding, 17°20'S, 146°00'E, Dec 1972, *Hyland* 7893 (BRI, QRS); The Boulders, Babinda, 17°21'S, 145°55'E, Dec 1972, *Birch* 89 (BRI); Bartle Frere, Oct 1935, *Flecker* 845 (QRS); Tchupala Falls – Crawford's Lookout walk, 17°36'S, 145°48'E, Feb 1981, *Irvine* 2079 (QRS). NORTH KENNEDY DISTRICT: Jarra Creek, W of Tully, Nov 1951, *Smith* 4994 (BRI); near Cardwell, W of Kennedy, 18°1'–S, 145°5'–E, Sep 1938, *Blake* 9728 (BRI); upper reach of Deluge Inlet, Hinchinbrook Island, 18°24'S, 146°15'E, May 1972, *Webb & Tracey* 11187 (BRI); Exp. e/p 19, Burgoon L.A., Garrawalt, 18°30'S, 145°45'E, Jul 1975, *Sanderson* S707 (QRS); Wallaman N.P., 18°3'–S, 145°4'–E, Nov 1985, *Williams* 85324 (BRI).

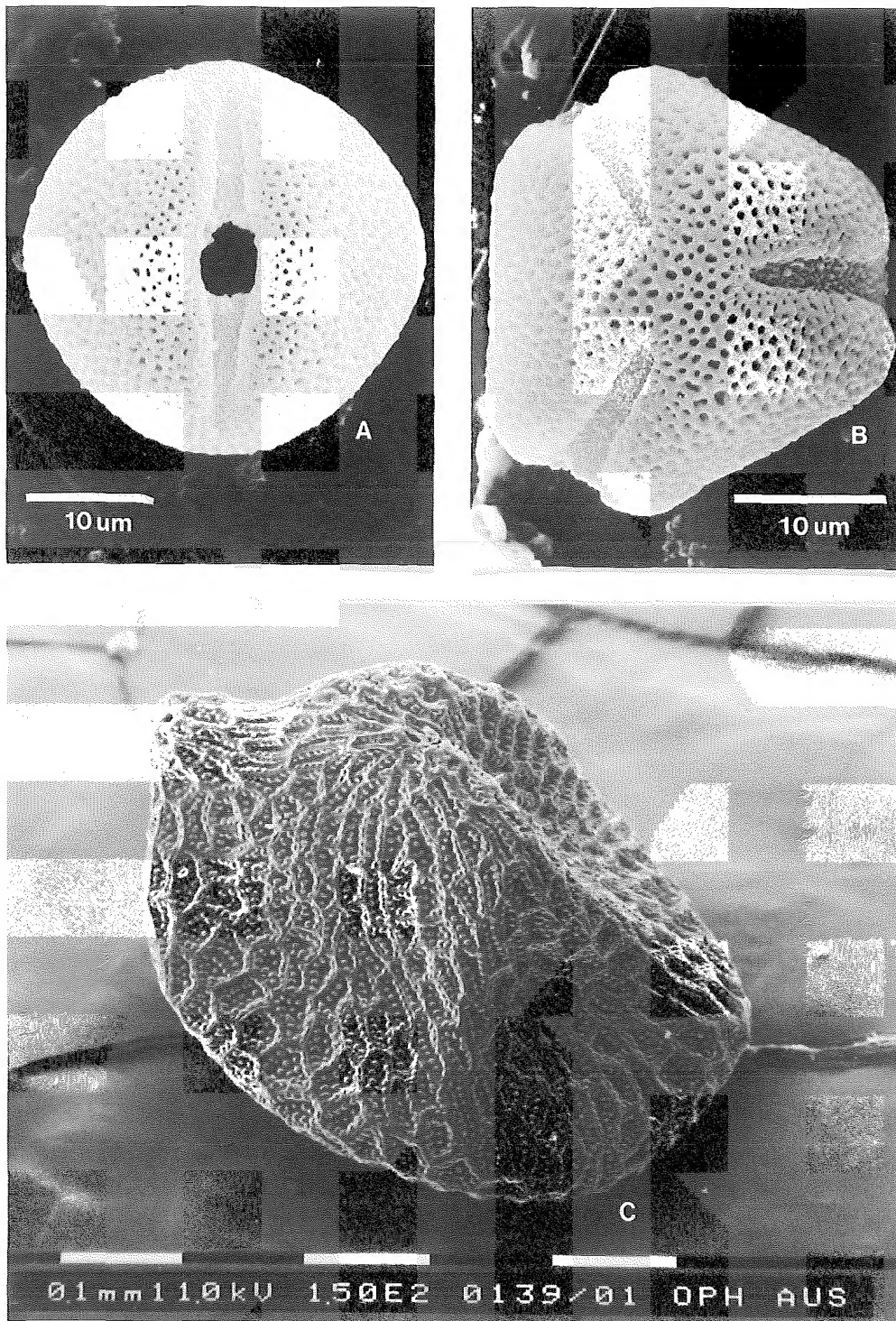


Fig. 1. Scanning electron micrographs of *Ophiorrhiza australiana* subsp. *australiana*: A,B, pollen. A, equatorial view. B, polar view. C, seed mounted with hilum viewed obliquely from the side. A,B, Webb & Tracey 13655, BRI; C, Webb & Tracey 10484.

**Distribution and habitat:** This subspecies is confined to the area between Cooktown and Ingham in north Queensland (Map 1) where it is found on alluvial soils of granitic origin and red loams along the banks of streams in rainforests and mesophyll vine forests in areas of good light penetration to the forest floor.

**Conservation status:** This subspecies is known to occur in a number of National Parks and is not considered to be rare, threatened or endangered at present.

**Notes:** The holotype is located at Kew. The sheet has a label in Bentham's hand 'Rockingham Bay Dallachy'. There is one specimen of this taxon in MEL (MEL 1583636) collected by Dallachy from Rockingham Bay which is dated (2nd March 1864) before the name was published. There is information on flower colour and height in Dallachy's hand which Bentham did not refer to in his protologue and there is no indication on the sheets that Bentham saw the specimen. It appears unlikely then that Bentham used this specimen in producing his protologue and therefore it is not considered to be type material. As to whether or not the MEL specimen is an isotype cannot be ascertained as there is no way of linking it to the holotype.

**Ophiorrhiza australiana** subsp. *heterostyla* Halford, subsp. nov. floribus heterostylibus, corollae lobis 1.5–4.0 mm longis, folii lamina supra pilis albidis ascendentibus usque appressis plus minusve strictis ornata diagnoscenda. **Typus:** Queensland. COOK DISTRICT: Massey Gorge, c. 23 km NW of Silver Plains Station, 13°50'S, 143°24'E, 9 November 1980, J.R. Clarkson 3619 (holo: BRI; iso: QRS).

Young stems, peduncles and petioles densely hairy with weak crisped whitish hairs. Leaf lamina covered with scattered, more or less straight, erect to appressed hairs, with weak, crisped, hairs on midvein, secondary veins and leaf margins; midrib and secondary veins stramineous to whitish. Flowers heterostylous; corolla lobes 1.5–4 mm long. Fig. 2.

Pollen of this subspecies has not been examined due to insufficient material available.

**Representative specimens:** Queensland. COOK DISTRICT: "Steelwire Bridge" East Claudie River, 12°43'S, 143°19'E, Dec 1981, Tucker 305 (QRS); Mt Tozer, near Iron Range, 12°45'S, 143°12'E, Nov 1977, Tracey 14859 (BRI, QRS); Claudie River, 12°45'S, 143°15'E, Oct 1973, Hyland 6984 (QRS); Tozer Gap, Tozer Range, Jun 1948, Brass 19374 (BRI); slopes of Iron Range (Mt Lamond), Nov 1956, Webb 3233 (BRI); Leo Creek, Upper Nesbit River, Aug 1948, Brass 19853 (BRI); T.R. 14, Leo Creek Road, 13°40'S, 143°20'E, Sep 1972, Irvine 369 (QRS); McIlwraith Range, c. 11 miles [18 km] NE by E of Coen, Oct 1962, Smith 11798 (BRI); upper reaches of Chester River on eastern fall of McIlwraith Range, 13°43'S, 143°24'E, Jul 1978, Clarkson 2430 (BRI); T.R. 14 (McIlwraith Range – Leo Creek road), 13°45'S, 143°20'E, Sep 1975, Hyland 8439 (QRS); Massey Gorge, on eastern fall of McIlwraith Range, 13°49'S, 143°23'E, Sep 1979, Clarkson 2633 (BRI, QRS); McIlwraith Range, 13°50'S, 143°15'E, Sep 1974, Hyland 7625 (QRS); headwaters of Massey Creek near old mining site, McIlwraith Range, c. 13°50'S, 143°20'E, Oct 1969, Webb & Tracey 9101 (BRI); Rocky River near E boundary of T.R. 14, 13°50'S, 143°25'E, Sep 1973, Dockrill 713 (QRS); headwaters of Lankelly Creek on western fall of McIlwraith Range, c. 13°52'S, 143°20'E, Oct 1969, Webb & Tracey 9553 (BRI); SE slopes of McIlwraith Range, c. 13°55'S, 143°15'E, Aug 1966, Curtis 365 (BRI).

**Distribution and habitat:** This subspecies is confined to the Iron and McIlwraith Ranges on Cape York Peninsula (Map 1) where it is found on soils derived from granitic and metamorphic rocks along banks of creeks in sclerophyll, mesophyll and notophyll vine forest in areas of good light penetration to the forest floor.

**Conservation status:** Although this subspecies is found only in the forests of two mountain ranges on Cape York Peninsula, it is not considered to be rare, threatened or endangered at present. It is known to occur in the Iron Range National Park.

**Notes:** Heterostyly has been reported in numerous genera in the Rubiaceae (Verdcourt 1958). There has been differing views, however, as to whether or not heterostyly occurs in *Ophiorrhiza*. Schumann (1891) considered it to be well developed in the genus while more recently Verdcourt (1958) reported it as being absent. Backer and Bakhuizen Van den Brink (1965) record that *O. canescens* Blume and *O. marginata* Blume are heterostylous. Vuilleumier (1967) did not record heterostyly in *Ophiorrhiza* in her survey of heterostyly in the Angiosperms. Darwin's (1976) revision of the Pacific species of *Ophiorrhiza* produced no evidence of heterostyly although he reported the variable location of the stamens in *O. leptantha*. However as he points out, this is not heterostyly in the true sense as the positions of the stigma and anthers are not exactly reversed from flower to flower. It is clear from the Australian material of *Ophiorrhiza* that heterostyly does occur in the genus.



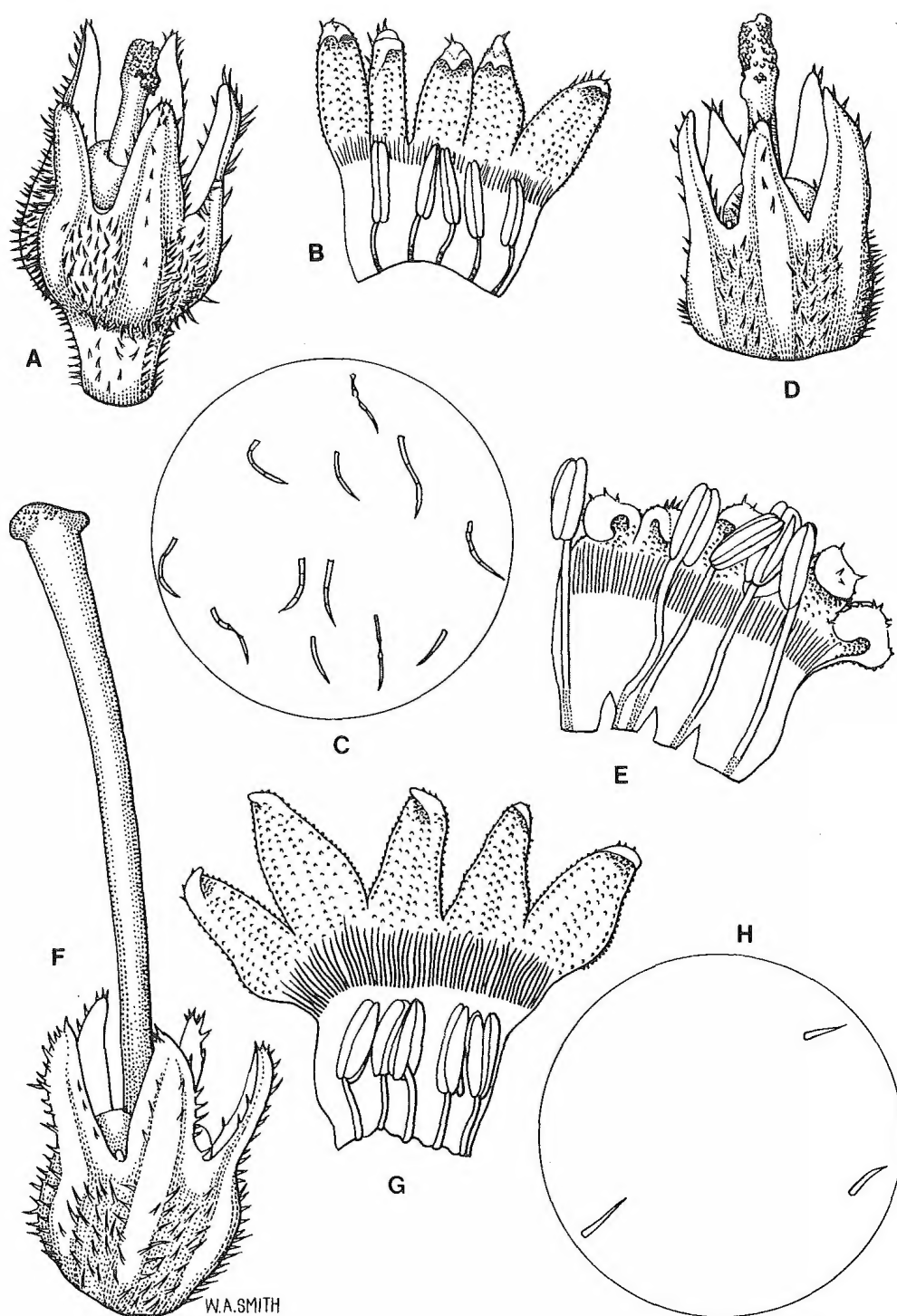
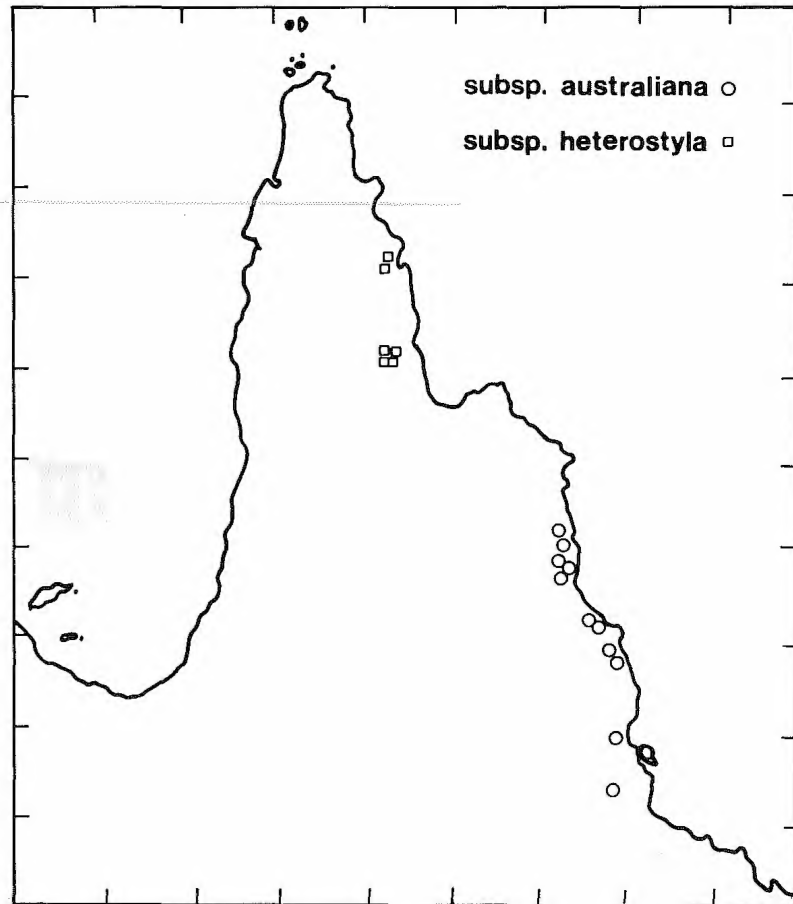


Fig. 2. *Ophiorrhiza australiana* subsp. *australiana*: A. ovary, calyx lobes and style  $\times 18$ . B. corolla opened out  $\times 9$ . C. portion of upper leaf surface  $\times 18$ . *O. australiana* subsp. *heterostyla*: D,E, short styled flower; D. ovary, calyx lobes and style  $\times 18$ . E. corolla opened out  $\times 9$ . F,G, long styled flower. F. ovary, calyx lobes and style  $\times 18$ . G. corolla opened out  $\times 9$ . H. portion of upper leaf surface  $\times 18$ . A,B, Michael 568; C, Thorsborne 423; D,E,H, Clarkson 3619; F,G, Webb & Tracey 9101.



Map 1. Distribution of subspecies of *Ophiorrhiza australiana*.

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